

2.2 DEFINITIONS

Revise existing definitions and add new definitions as follows:

Aggradation – A general and progressive increase of the longitudinal profile of the channel bed as a result of long-term deposition of sediments.

Base Flood—The flood or tide having a 1% chance of being exceeded in any given year. Also known as Q_{100} .

~~Check Flood for Bridge Scour~~—~~Check flood for scour....and remain stable with no reserve. See also superflood.~~

Contraction scour – See “General Scour”, below.

Degradation – A general and progressive lowering of the longitudinal profile of the channel bed as a result of long-term erosion.

Design Flood—The flood or tide having a 2% chance of being exceeded in any given year. Also known as Q_{50} .

~~Design Flood for Bridge Scour~~—~~The flood flow equal to or ...as a result of the potential for pressure flow.~~

~~Design Flood for Waterway Opening~~—~~The peak discharge...of the design flood for the waterway opening.~~

Flood of Record—The largest recorded flood at the bridge site.

Freeboard—The vertical distance from bridge soffit, bottom-of-girder, ~~or~~ other physical feature to the water surface at a give discharge.

General or Contraction Scour—Scour in a channel or on a floodplain that is not localized at a pier or other obstruction to flow. In a channel, general/contraction scour usually affects all or most of the channel width and is typically associated with sediment transport with the watershed or caused by a contraction of the flow within a specific reach due to channel geometrics.

Local (Pier) Scour—Scour in a channel or on a floodplain that is localized at a pier, abutment, or other obstruction to flow.

Overtopping Flood – The discharge and exceedance interval associated with that discharge that will overtop the bridge and/or the approaches immediately adjacent to the bridge.

~~One Hundred Year Flood~~—~~The flood due to storm and/or tide having a 1 percent chance of being equaled or exceeded in any given year.~~

River Training Structure—Any configuration constructed in a stream or placed on, adjacent to, or in the vicinity of a streambank to deflect current, induce sediment deposition, induce scour, or in some other way alter the natural flow and sediment regimens of the stream.

Scour—The addition of contraction scour, aggradation, degradation, and local pier scour. Also referred to as total scour.

2.5.2.6.3 *Optional Criteria for Span-to-Depth Ratios*

Revise the 1st paragraph as follows:

Unless otherwise specified herein, if an Owner chooses to invoke controls on span-to-depth ratios, the limits in Table C1, in which S is the slab span length and L is the span length both in ft., may be considered in the absence of other criteria. Where used, the limits in Table C1 shall be taken to apply to overall depth unless noted.

Revise Table 1 as Commentary. Content remains unchanged.
Table C 2.5.2.6.3-1 Traditional Minimum Depths for
Constant Depth Superstructures.

2.5.5 Bridge Aesthetics

Revise the 1st paragraph as follows:

Bridges should complement their surroundings, be graceful in form, and present an appearance of adequate strength. Hydraulic input with respect to pier shape, location and skew, pier wall vs. column, abutment type, soffit elevation and barrier needs shall still be considered.

2.6 HYDROLOGY AND HYDRAULICS

2.6.1 General

Revise the 3rd paragraph as follows:

Evaluation of bridge design alternatives shall consider, and is not limited to the impacts associated with stream stability, floating debris, backwater, flow distribution, stream velocities, scour potential, flood hazards, tidal dynamics where appropriate and consistency with established criteria for the National Flood Insurance Program.

2.6 HYDROLOGY AND HYDRAULICS

2.6.1 General

2.6.2 Site Data

C2.6.2

Revise the 1st and 2nd paragraphs as follows:

The assessment of hydraulics necessarily involves many assumptions. Key among these assumptions are the roughness coefficients and projection of long-term flow magnitudes, ~~e.g., the 500-year flood or other superfloods.~~ The runoff from a given storm can be expected to change with the seasons, immediate past weather conditions, and long-term natural and man-made changes in surface conditions. The ability to statistically project long recurrence interval floods is a function of the adequacy of the database of past floods, and such projections often change as a result of new experience.

The above factors make the ~~check-flood~~ investigation of scour an important, but highly variable, safety criterion that may be expected to be difficult to reproduce, unless all of the Designer's original assumptions are used in a post-design scour investigation. Obviously, those original assumptions must be reasonable given the data, conditions, and projections available at the time of the original design.

2.6.3 Hydrologic Analysis

Revise the 2nd to 5th “bullets” as follows:

- For assessing flood hazards and meeting all local, state, and federal floodplain management requirements—the 100-year flood;
- For assessing risks to highway users and damage to the bridge and its roadway approaches—the overtopping flood and/or the design base flood for bridge scour;
- ~~For assessing catastrophic flood damage at high risk sites a check flood of a magnitude selected by the Owner, as appropriate for the site conditions and the perceived risk;~~
- For investigating the adequacy of bridge foundations to resist scour—the base flood shall be used ~~check flood for bridge scour;~~
- ~~To satisfy agency design policies and criteria design floods for waterway opening and bridge scour for the various functional classes of highways; The floods for waterway openings are the Q_{50} design flood with adequate freeboard to pass anticipated drift, Q_{100} base flood without freeboard, or the flood of record without freeboard, whichever is greater.~~
- To calibrate water surface profiles and to evaluate the performance of existing structures—historical floods, and
- To evaluate environmental conditions—low or base flow information, and in estuarine crossings, the spring and tide range.

2.6.4.3 Bridge Waterway

Revise the 2nd bullet as follows:

- The evaluation of trial combinations of highway profiles, alignments, superelevations and bridge lengths and widths for consistency with design objectives. ~~should provide adequate freeboard to pass anticipated drift for the Q_{50} design flood, to pass the Q_{100} base flood without freeboard, or the flood of record without freeboard, whichever is greater.~~

2.6.4.4.2 Bridge Scour

Revise the 1st paragraph as follows:

As required by Article 3.7.5, scour at bridge foundations is investigated for ~~two conditions~~:

- ~~For the Q_{100} base design flood for scour, the streambed material in the scour prism above the total scour line shall be assumed to have been removed for design conditions. The design flood storm surge, tide, or mixed population flood shall be the more severe of the 100-year events or from an overtopping flood of lesser recurrence interval.~~
- ~~For the check flood for scour, the stability of bridge foundation shall be investigated for scour conditions resulting from a designated flood storm surge, tide, or mixed population flood not to exceed the 500-year event or from an overtopping flood of lesser recurrence interval. Excess reserve beyond that required for stability under this condition is not necessary. The extreme event limit state shall apply.~~

Revise the 3rd and 4th paragraphs as follows:

Spread footings ~~for columns or piers~~ on soil or erodible rock shall be located so that the ~~bottom~~ top of footing is below scour depths due to degradation, contraction, and local pier scour during determined for the a check Q_{100} base flood for scour.

Deep foundations with footings shall be designed to place the top of the footing below the estimated degradation plus contraction scour depth where practical to minimize obstruction to flood flows and resulting local scour. The bottom of footing shall be located below the estimated total scour. However, the footing may be located above this level provided the piles and pile connections are designed to withstand this condition. ~~Even lower elevations should be considered for pile-supported footings where the piles could be damaged by erosion and corrosion from exposure to stream currents. Where conditions dictate a need to construct the top of a footing to an elevation above the streambed, attention shall be given to the scour potential of the design.~~

C2.6.4.4.2

Revise the 4th paragraph as follows:

Total scour is calculated based upon the cumulative effects of the long-term degradation scour, general (contraction) scour and local scour due to the base design flood. Figure C1 shows degradation, contraction, and local pier scour depth for a typical spread footing foundation. The life expectancy of the bridge should be considered in determining the total degradation or aggradation of the waterway. Long-term scour is based on an assumed 75-yr design life for new construction projects. The recommended procedure for determining the total scour depth at bridge foundations is as follows:

(bullets remain the same as AASHTO).

Add Fig. C2.6.4.4.2-1 as follows:

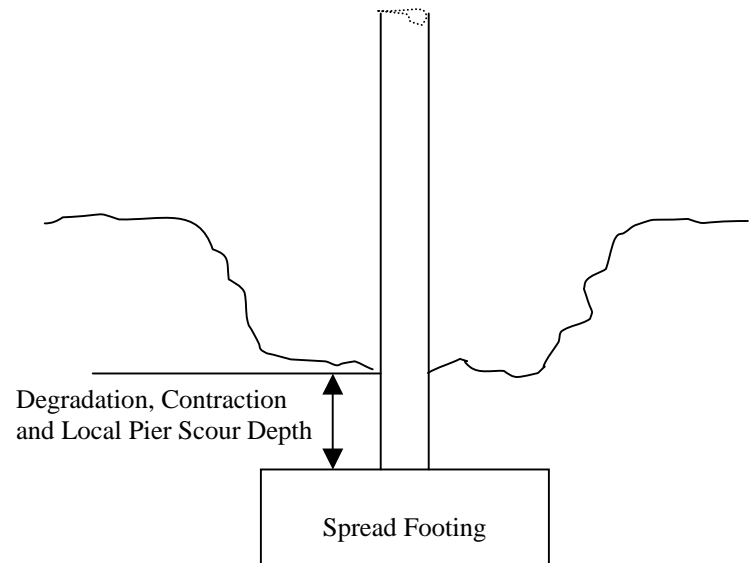


Figure C2.6.4.4.2-1 – Spread Footing Location

2.6.4.4.2 Bridge Scour (cont.)

Revise the last paragraph as follows:

The stability of abutments in areas of turbulent flow shall be thoroughly investigated. Exposed embankment slopes should be protected with appropriate ~~scour~~ countermeasures. Abutment footings shall be designed so as to be stable for permanent loads and hydraulic forces assuming the loss of approach fill. Deep foundations may be necessary.

C2.6.4.4.2 (cont.)

Revise the 6th paragraph as follows:

Foundations should be designed to withstand the conditions of scour for the Q_{100} base design flood and the check flood. In general, this will result in deep foundations. However, environmental concerns may preclude locating the footing below anticipated scour level. Figure C2 shows degradation, local contraction and local pier scour for a typical deep foundation. The design of the foundations of existing bridges that are being rehabilitated should consider appropriate countermeasures, underpinning if scour indicates the need. ~~Riprap and other scour countermeasures may be appropriate if underpinning is not cost effective.~~

Add Fig. C2.6.4.4.2-2 as follows:

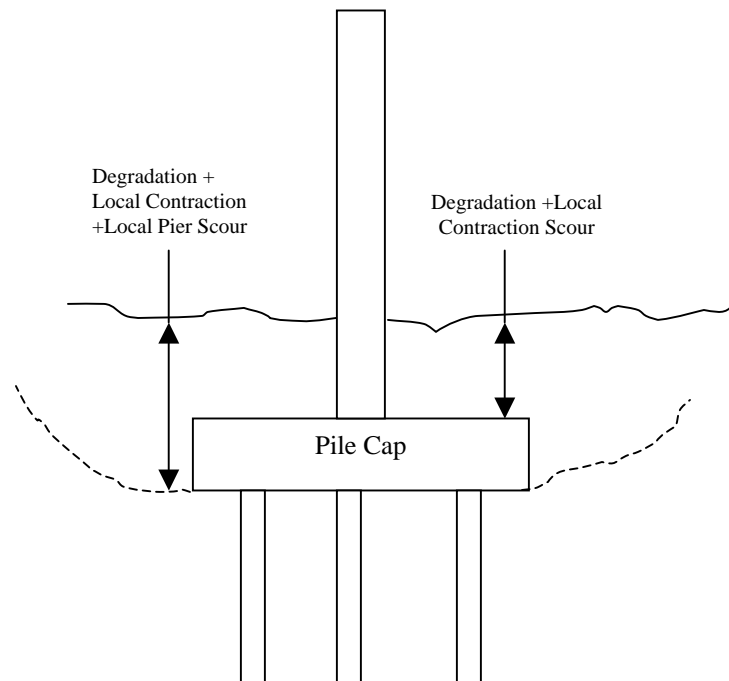


Figure C2.6.4.4.2-2 – Deep Foundation Location